



[4910-13]

## DEPARTMENT OF TRANSPORTATION

### Federal Aviation Administration

#### 14 CFR Part 25

[Docket No. FAA-2015-4086; Special Conditions No. 25-605-SC]

#### Special Conditions: Boeing Model 787-9 Airplane; Structure-Mounted Airbags

**AGENCY:** Federal Aviation Administration (FAA), DOT.

**ACTION:** Final special conditions; request for comments.

**SUMMARY:** These special conditions are issued for the Boeing Model 787-9 airplane. This airplane will have a novel or unusual design feature when compared to the state of technology envisioned in the airworthiness standards for transport-category airplanes. This design feature is airbags mounted to structure to prevent serious injury. The applicable airworthiness regulations do not contain adequate or appropriate safety standards for this design feature. These special conditions contain the additional safety standards that the Administrator considers necessary to establish a level of safety equivalent to that established by the existing airworthiness standards.

**DATES:** This action is effective on Boeing on [Insert date of publication in the Federal Register]. We must receive your comments by [Insert date 45 days after publication in the Federal Register] using any of the following methods:

- *Federal eRegulations Portal:* Go to <http://www.regulations.gov/> and follow the online instructions for sending your comments electronically.
- *Mail:* Send comments to Docket Operations, M-30, U.S. Department of Transportation (DOT), 1200 New Jersey Avenue, SE., Room W12-140, West Building Ground Floor, Washington, DC, 20590-0001.

- *Hand Delivery or Courier:* Take comments to Docket Operations in Room W12-140 of the West Building Ground Floor at 1200 New Jersey Avenue, SE., Washington, DC, between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays.
- *Fax:* Fax comments to Docket Operations at 202-493-2251.

*Privacy:* The FAA will post all comments it receives, without change, to <http://www.regulations.gov/>, including any personal information the commenter provides. Using the search function of the docket Web site, anyone can find and read the electronic form of all comments received into any FAA docket, including the name of the individual sending the comment (or signing the comment for an association, business, labor union, etc.). DOT's complete Privacy Act Statement can be found in the **Federal Register** published on April 11, 2000 (65 FR 19477-19478), as well as at <http://DocketsInfo.dot.gov/>.

*Docket:* Background documents or comments received may be read at <http://www.regulations.gov/> at any time. Follow the online instructions for accessing the docket or go to Docket Operations in Room W12-140 of the West Building Ground Floor at 1200 New Jersey Avenue, SE., Washington, DC, between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays.

**FOR FURTHER INFORMATION CONTACT:** Jeff Gardlin, FAA, Airframe and Cabin Safety Branch, ANM-115, Transport Airplane Directorate, Aircraft Certification Service, 1601 Lind Avenue SW., Renton, Washington 98057-3356; telephone 425-227-2136; facsimile 425-227-1232.

## **SUPPLEMENTARY INFORMATION:**

The FAA has determined that notice of, and opportunity for prior public comment on, these special conditions is impracticable because these procedures would significantly delay issuance of the design approval and thus delivery of the affected airplane.

In addition, the substance of these special conditions has been subject to the public comment process in prior instances with no substantive comments received. The FAA therefore finds that good cause exists for making these special conditions effective upon publication in the **Federal Register**.

### **Comments Invited**

We invite interested people to take part in this rulemaking by sending written comments, data, or views. The most helpful comments reference a specific portion of the special conditions, explain the reason for any recommended change, and include supporting data.

We will consider all comments we receive by the closing date for comments. We may change these special conditions based on the comments we receive.

### **Background**

On July 5, 2009, The Boeing Company applied for a change to type certificate no. T00021SE for structure-mounted airbags in the Model 787-9 airplane. The Model 787-9 airplane, which is a derivative of the Model 787 series currently approved under type certificate no. T00021SE, has a maximum passenger capacity of 420 passengers and a maximum takeoff weight of 557,000 lbs.

### **Type Certification Basis**

Under the provisions of Title 14, Code of Federal Regulations (14 CFR) 21.101, The Boeing Company must show that the 787-9, as changed, continues to meet the applicable

provisions of the regulations reference listed in type certificate no. T00021SE or the applicable regulations in effect on the date of application for the change, except for earlier amendments as agreed upon by the FAA.

The certification basis includes certain special conditions, exemptions, or later amended sections of the applicable part that are not relevant to these special conditions.

If the Administrator finds that the applicable airworthiness regulations (i.e., 14 CFR part 25) do not contain adequate or appropriate safety standards for the Model 787-9 airplane because of a novel or unusual design feature, special conditions are prescribed under the provisions of § 21.16.

Special conditions are initially applicable to the model for which they are issued. Should the type certificate for that model be amended later to include any other model that incorporates the same novel or unusual design feature, or should any other model already included on the same type certificate be modified to incorporate the same novel or unusual design feature, these special conditions would also apply to the other model under § 21.101.

In addition to the applicable airworthiness regulations and special conditions, the Model 787-9 airplane must comply with the fuel-vent and exhaust-emission requirements of 14 CFR part 34 and the noise-certification requirements of 14 CFR part 36.

The FAA issues special conditions, as defined in 14 CFR 11.19, in accordance with § 11.38, and they become part of the type certification basis under § 21.101.

### **Novel or Unusual Design Features**

The Model 787-9 airplane will incorporate the following novel or unusual design feature:  
Airbags mounted to structure to prevent head injury.

## Discussion

Boeing proposes to install structure-mounted airbags instead of inflatable lap belts as a means to protect each occupant from serious injury in the event of an emergency landing, as required by § 25.562(c)(5), on 787-9 airplanes equipped with B/E Aerospace Super-Diamond Model business-class passenger seats.

Such use of airbags to provide injury protection for the occupant is a novel or unusual feature for this airplane model, and the applicable airworthiness regulations do not contain adequate or appropriate airworthiness standards for these design features. Therefore, special conditions are needed to address requirements particular to installation of airbags in this manner.

Special conditions exist for airbags installed on seat belts, known as inflatable lap belts, which have been installed on Boeing passenger seats. Structure-mounted airbags, although a novel design, were first introduced on Jetstream Aircraft Limited Model 4100 series airplanes, which resulted in issuance of Special Conditions 25-ANM-127 on May 14, 1997. These special conditions supplemented 14 CFR part 25 and, more specifically, §§ 25.562 and 25.785.

The structure-mounted airbag, similar to the inflatable lap belt, is designed to limit occupant forward excursion in the event of an emergency landing. These airbags will reduce the potential for serious injury, including reducing the head injury criterion (HIC) measurement defined in part 25. However, structure-mounted airbags function similarly as automotive airbags, where the airbag deploys from the furniture that is in front of the passenger, relative to the airplane's direction of flight, forming a barrier between the structure and occupant. Also, unlike the inflatable lap belt, the structure-mounted airbag does not move with the occupant. To account for out-of-position and brace-position occupants, the airbag is designed to conform to the curvature of the exposed structure in the head-strike zone.

Because the airbag system is essentially a single-use device, it could deploy under crash conditions that are not sufficiently so severe as to require the injury protection the airbag system provides. Because an actual crash is frequently composed of a series of impacts before the airplane comes to rest, a larger impact following the initial impact could render the airbag system unavailable. This potential situation does not exist with standard upper-torso restraints, which tend to provide continuous protection regardless of impact severity, or number of impacts, in a crash event. Therefore, the airbag-system installation should be such that it provides protection, when it is required, by not expending its protection when it is not required. If the airbag deployment threshold is unnecessarily low, the airbag would need to continue to provide protection when an impact requiring protection occurs.

These special conditions contain the additional safety standards that the Administrator considers necessary to establish a level of safety equivalent to that established by the existing airworthiness standards.

### **Applicability**

As discussed above, these special conditions are applicable to the Boeing Model 787-9 airplane. Should The Boeing Company apply at a later date for a change to the type certificate to include another model incorporating the same novel or unusual design feature, these special conditions would apply to that model as well.

### **Conclusion**

This action affects only certain novel or unusual design features on one model series of airplane. It is not a rule of general applicability.

Under standard practice, the effective date of final special conditions would be 30 days after the date of publication in the **Federal Register**; however, as the certification date for the

Boeing Model 787-9 airplane is imminent, the FAA finds that good cause exists to make these special conditions effective upon publication in the **Federal Register**.

### **List of Subjects in 14 CFR Part 25**

Aircraft, Aviation safety, Reporting and recordkeeping requirements.

The authority citation for these special conditions is as follows:

Authority: 49 U.S.C. 106(g), 40113, 44701, 44702, 44704.

### **The Special Conditions**

Accordingly, pursuant to the authority delegated to me by the Administrator, the following special conditions are issued as part of the type certification basis for Boeing Model 787-9 airplanes.

1. The applicant must demonstrate by test that the structure-mounted airbag will deploy and provide protection under crash conditions where it is necessary to prevent serious injury to a 50<sup>th</sup> percentile occupant, as specified in § 25.562. The means of protection must provide a consistent approach to energy absorption for a range of occupants, from a two-year-old child to a 95<sup>th</sup> percentile male.
2. The structure-mounted airbag must provide adequate protection for each occupant regardless of the number of occupants of the seat assembly.
3. The structure-mounted airbag system must not be susceptible to inadvertent deployment as a result of wear and tear, or inertial loads resulting from in-flight or ground maneuvers (including gusts and hard landings) likely to be experienced in service.
4. Deployment of the structure-mounted airbag must not introduce hazards or injury mechanisms to the seated occupant, including occupants in the brace position.

Deployment of the structure-mounted airbag must also not result in injuries that could impede rapid exit from the airplane.

5. The applicant must demonstrate that an inadvertent deployment that could cause injury to a standing or sitting person is improbable. Inadvertent deployment must not cause injury to anyone who may be positioned close to the structure-mounted airbag (e.g., seated in an adjacent seat, or standing adjacent to the airbag installation or the subject seat). Cases where a structure-mounted airbag is inadvertently deployed near a seated occupant or an empty seat must be considered.
6. Effects of the deflection and deformation of the structure to which the airbag is attached must be taken into account when evaluating deployment and location of the inflated airbag. The effect of loads imposed by airbag deployment, or stowed components where applicable, must also be taken into account.
7. Inadvertent deployment of the structure-mounted airbag during the most critical part of flight will either not cause a hazard to the airplane or is extremely improbable.
8. The applicant must demonstrate that the structure-mounted airbag, when deployed, does not impair access to the seatbelt- or harness-release means, and must not hinder evacuation. This will include consideration of adjacent seat places and the aisle.
9. The airbag, once deployed, must not adversely affect the emergency-lighting system, and must not block escape-path lighting to the extent that the light(s) no longer meet their intended function.
10. The structure-mounted airbag must not impede occupants' rapid exit from the airplane 10 seconds after its deployment.



11. Where structure-mounted airbag systems are installed in or close to passenger evacuation routes (other than for the passenger seat for which the airbag is installed), possibility of impact on emergency evacuation (e.g., hanging in the aisle, potential trip hazard, etc.) must be evaluated.
12. The airbag electronic system must be designed to be protected from lightning per 14 CFR 25.1316(b), and high-intensity radiated fields (HIRF) per 14 CFR 25.1317(c).
13. The structure-mounted airbag system must not contain or release hazardous quantities of gas or particulate matter into the cabin.
14. The structure-mounted airbag installation must be protected from the effects of fire such that no hazard to occupants will result.
15. The inflatable bag material must meet the 2.5-inches-per-minute horizontal flammability test defined in 14 CFR part 25, appendix F, part I, paragraph (a)(1)(iv).
16. The design of the structure-mounted airbag system must protect the mechanisms and controls from external contamination associated with that which could occur on or around passenger seating.
17. The structure-mounted airbag system must have a means to verify the integrity of the structure-mounted airbag activation system.

18. The applicant must provide installation limitations to ensure installation compatibility between the seat design and opposing monument or structure.

Issued in Renton, Washington, on October 30, 2015.

Michael Kaszycki  
Acting Manager, Transport Airplane Directorate  
Aircraft Certification Service  
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